International Journal of

SYSTEMS SCIENCE

The Theory and Practice of Mathematical Modelling, Simulation, Optimization and Control in relation to biological, economic, industrial and transportation systems

VOLUME 13

Editor: B. Porter

University of Salford, U.K.

Editorial Board:

S. Arimoto - - - Osaka
J. W. Bandler - - Hamilton
S. Barnett - - - Bradford
J. C. G. Boot - - Buffalo
R. C. Conant - - Chicago
R. Gorez - - - Louvain
L. T. Grujic - - Belgrade
S. C. Gupta - - Dallas
C. H. Houpis - - Ohio
G. J. Klir - - - Binghamton
V. Kucera - - - Prague
M. E. Merchant - Cininnati
R. Perret - - - Grenoble
R. Rosen - - - Halifax
J. K. Sengupta - Santa Barbara
Ya. Z. Tsypkin - - Moscow
J. L. Willems - - Ghent

Subscription Information

USA, Canada and Mexico (air freight): annual subscription (payable in advance), $420·00; per part $38·00 (surface post paid). Air freight and mailing in the USA by Publications Expediting Inc., 200 Meacham Avenue, Elmont, New York 11003. Second class postage paid at Jamaica, New York 11431. USA Postmaster: Send address changes to *International Journal of Systems Science*, Publications Expediting Inc., 200 Meacham Avenue, Elmont, New York 11003. US subscribers should send order and cheque (in favour of Taylor & Francis Ltd) to Account 04 810 879 Bankers Trust Company, P.O. Box 9137, Church Street Station, New York, N.Y. 10049.

Japan (accelerated surface post): apply to exclusive agents, Kinokuniya Company Ltd, Odakyu West-Shinjuku Building, 47–1 Hatsudai 1-chome, Shibuya-ku, Tokyo 151. Telex 2322535.

FR Germany (surface post): annual subscription (payable in advance), DM 672·00; per part DM 61·00. Subscribers in FR Germany should send order and cheque (in favour of Taylor & Francis Ltd) to Account No. 073/6686, Deutsche Bank AG, BLZ 500 700 10, Postfach 2623, Rossmarkt 18, 6000 Frankfurt/Main 1.

UK and the rest of the world (surface post; accelerated surface post to Australasia; air freight to India): annual subscription (payable in advance), £140·00; per part £13·00 (surface post paid).

Published monthly by Taylor & Francis Ltd, 4 John Street, London WC1N 2ET, UK. Telex 858540.

Printed by Taylor & Francis (Printers) Ltd, Rankine Road, Basingstoke, Hampshire RG24 0PR, UK.

© 1982 Taylor & Francis Ltd. ISSN 0020–7721.

CONTENTS OF VOLUME 13

NUMBER 1

Performance-related reliability evaluation of a three-unit hybrid redundant system
By S. Osaki and M. Kinugasa 1

A maximum likelihood identification method for stable autoregressive linear systems
By H. Inaba, I. Shioya and M. Ichino 21

A minimax policy for optimal portfolio choice
By J. K. Sengupta 39

Medium-term planning with a multisectoral dynamic model of the U.K. economy
By F. Van Der Ploeg 57

The general cyclical allocation algorithm for packet-switched store-and-forward computer communication network design
By I. Rudowsky and J. Rootenberg 73

Modal sensitivity to discretization
By J. A. Gibson and M. A. Hamilton-Jenkins 85

The linear–quadratic-gaussian problem for singularly perturbed systems
By Ram-Nandan P. Singh 93

A second order singular linear system arising in electric power systems analysis
By S. L. Campbell and N. J. Rose 101

On reachability over polynomial rings and a related genericity problem
By E. B. Lee and A. W. Olbrot 109

NUMBER 2

Analysis of the functional dependence of the modified parity-condition parameter on its argument for an important class of Lanchester-type equations for modern warfare
By J. G. Taylor 115

Instrument fault detection in systems with uncertainties
By K. Watanabe and D. M. Himmelblau 137

Strategies using interrupted observations for hitting a moving target
By Y. Yavin 159

Stabilization of 2D filters using 2D observers
By T. Hinamoto, F. W. Fairman and J. Shimonishi 177

Hierarchical dynamic optimization of the fermentation process for producing gramicidin S, using microprocessors
By A. S. FAWZY and O. R. HINTON 193

Parameter identification via Laguerre polynomials
By C. HWANG and Y.-P. SHIH 209

Walsh series expansion of composite functions and its application to linear systems
By W.-L. CHEN and C.-L. LEE 219

NUMBER 3

Approach to decentralized marketing-production planning
By P. L. ABAD 227

Optimization of bilinear control systems
By I. DERESE and E. NOLDUS 237

Identification of a heat transfer system using the Galerkin method
By T. YOSHIMURA and A. CAMPO 247

A finite-time linear filter for discrete-time systems in singular case
By J. O'REILLY 257

'Small delay-term' type stabilizability criteria for linear systems with delay
By T. MORI and M. KUWAHARA 265

Efficiency measurement in stochastic input–output systems
By J. K. SENGUPTA 273

An alternative approach to non-linear filtering: maximizing the probability of hitting a target set
By Y. YAVIN 289

Multipartitioning in distributed parameter adaptive estimation
By P. STAVROULAKIS and S. G. TZAFESTAS 301

Some probability distributions related to the arrival of demands in a two-echelon inventory system
By C. LEFEVRE 317

Saddle points and duality in multi-objective programming
By T. TANINO 323

A comparison of linear and optimal non-linear filters for a machine maintenance problem
By K. H. WICKWIRE 337

NUMBER 4

On the evaluation of strategies for stochastic scheduling problems with order constraints
By K. D. GLAZEBROOK 349

On some models for developmental systems. Part I. Organism structure on the basis of elementary transformations
By S. WĘGRZYN, J. C. GILLE and P. VIDAL 359

On some models for developmental systems. Part II. Evolution of the cellular composition
By J. C. GILLE, P. VIDAL, S. WĘGRZYN and Y. OUELLET 379

Sufficient conditions for the exponential *p*-stability and *p*-stabilizability of linear stochastic systems
By T. SASAGAWA 399

Optimal diagnostic procedure for failures in a series system
By K. S. PARK 409

Optimal strategies for space-dependent discrete-time dynamic games
By S. G. TZAFESTAS 413

Filtering with unreliable sensors
By D. N. P. MURTHY 437

Dynamic modelling and control in water resources systems
By M. S. MAHMOUD, M. F. HASSAN and M. I. YOUNIS 453

NUMBER 5

A linear decision analysis model of optimal portfolio investments
By W. T. LIN and J. C. G. BOOT 469

On the convergence of the block-pulse series solution of a linear time-invariant system
By W.-L. CHEN and C.-L. LEE 491

Construction of stable inverses for linear systems
By R. V. PATEL 499

Control of a biological clock with light
By R. J. SCHILLING 517

Piecewise linear system identification via Walsh functions
By G. P. RAO and L. SIVAKUMAR 525

Order transmission efficiency in large hierarchical organizations
By B. ROEHNER 531

Prediction of the peak flood using revised GMDH algorithms
By T. YOSHIMURA, U. S. PANDEY, T. TAKAGI and T. SOEDA 547

Bayes' error and its sensitivity in statistical pattern recognition in noisy environment
By B. B. CHAUDHURI 559

A method for the algebraic solution of a class of non-stationary, discrete-time, two-point boundary-value problems
By F. ANDRIA 571

A solvable stochastic model of population growth in a region with threshold effect
By KARMESHU 581

NUMBER 6

Singular perturbation methods in the synthesis of control policies for production–inventory systems
By A. BRADSHAW, K. L. MAK and B. PORTER 589

Two-level solution algorithms for constrained dynamic optimization problems
By J. HIRVONEN 601

Generalized Chandrasekhar algorithms for distributed-parameter filtering problem with pointwise coloured measurement noise
By K. WATANABE 619

Compensator design for gimbaless inertial systems
By A. J. GRAMMATICOS and G. BITSORIS 639

A relation between the decomposition into a disjunctive complex system and the Sprague–Grundy function
By Y. TAKAHARA, B. NAKANO and J. IIJIMA 651

Functional approximation of planar curves via adaptive segmentation
By F. BADI'I and B. PEIKARI 667

Analysis of two-unit stand-by redundant system under partial failure and pre-emptive repair priority
By S. M. GUPTA, N. K. JAISWAL and L. R. GOEL 675

A conversational dynamic model of adaptive biological population
By T. M. ROMANOWICZ and J. W. OWSIŃSKI 683

Single-input–single-output system identification via block-pulse functions
By BING CHENG and MING-SHOW HSU 697

Phase plane presentation of electrocardiograms
By N. G. NATH and A. DAS 703

Book Review 707

NUMBER 7

Qualitative behaviour of solutions to some non-linear Lanchester-type models that consider parallel acquisition of targets
By J. G. TAYLOR 709

A stochastic model of the maximal consumption in gas networks
By D. SINGER 733

Unconstrained quasi-continuous representation of multivariable discrete systems
By J. A. GIBSON and M. A. HAMILTON-JENKINS 741

On optimal control of plasma confinement
By S. P. BANKS and S. A. MOUSAVI-KHALKHALI 757

Explicit solutions of integral equations via block pulse functions
By CHI-HSU WANG and YEN-PING SHIH 773

Laguerre series solution of a functional differential equation
By CHI HWANG and YEN-PING SHIH 783

Money illusion, beta perceptions, and capital market segmentation
By J. A. SCHNABEL 789

Optimal input signals for parameter estimation in linear distributed parameter systems
By E. RAFAJŁOWICZ 799

The finite zeros of diminished systems
By R. G. CAMERON 809

NUMBER 8

Urban two-lane highway with quasi-dense traffic: analysis, finite element modelling, perturbation method and optimal control
By G. JUMARIE 819

Redundancy optimization by linear knapsack approach
By D. K. YUN and K. S. PARK 839

Game theory models applied to economic systems: their information, structure and stability
By J. K. SENGUPTA 849

A two-period stochastic inventory model
By P. FANCHON and J. K. SENGUPTA 869

Identifiability study of an aquatic ecosystem model
By S. GENTIL 881

A model of energy systems and its macro-properties
By H. HIRATA 897

Sensitivity analysis of singularly perturbed systems
By M. KODA 909

The regional planning of sociosanitary services: methodologies and techniques of analysis
By F. ANDRIA 921

Analysis of non-linear systems via single term Walsh series approach
By K. R. PALANISAMY 929

Book review 937

NUMBER 9

Informetric analysis of dynamic decision rules in applied economic models: a selective survey
By J. K. SENGUPTA 939

Analysis of stiff systems via single step method of block pulse functions
By K. R. PALANISAMY and D. K. BHATTACHARYA 961

Non-smooth and non-convex problems in discrete optimal control
By J. DOLEŽAL 969

Design of stochastic discrete time linear optimal regulators. Part I. Relationship between control laws based on a time series approach and a state space approach
By K. P. LAM 979

Design of stochastic discrete time linear optimal regulators. Part II. Extension and computational procedures
By K. P. LAM 1001

Separability of transfer function matrices of 2D linear systems by state feedbacks
By T. KACZOREK 1013

A procedure for recognition of connected handwritten numerals
By S. K. PARUI, B. B. CHAUDHURI and D. DUTTA MAJUMDER 1019

Hybrid approximation technique for multivariable control systems
By A. KOSTOVETSKY 1031

Multistage stochastic linear differential game with decision-time constraint
By C. K. LAU and C. T. LEONDES 1047

NUMBER 10

Linear optimal control of national econometric models
By M. S. MAHMOUD and M. T. HANNA 1061

Canonic form state space realization of two dimensional transfer functions having separable denominator
By T. HINAMOTO and S. MAEKAWA 1083

Computation of suboptimal Nash strategies for a stochastic differential game under partial observation
By Y. YAVIN 1093

Lower bounds for convex programmes
By C. H. SCOTT and T. R. JEFFERSON 1109

Lumped model of a non-linear distributed system by finite element method
By M. B. BRAHMANANDAM and B. N. CHATTERJI 1117

Parameter identification via shifted Legendre polynomials
By RONG-YEU CHANG and MAW-LING WANG 1125

A simple, direct derivation of digital network sensitivities
By J. A. HEINEN and S. E. REYER 1137

Optimal control of economic growth with application to Korean economy
By SUNG JOO PARK 1141

Relationship between steady state Kalman filter gain and noise variances
By MASATOSHI NAKAMURA 1153

A modal approach for estimation in distributed parameter systems
By O. IBIDAPO-OBE 1165

NUMBER 11

Exact model-matching control of three-dimensional systems using state and output feedback
By S. G. TZAFESTAS and T. G. PIMENIDES 1171

Computer diagnosis from EEG signals using bootstrap identification
By S. S. ALSHORIDH and R. M. PRASAD 1189

Active identification of dynamic systems in face of 'coloured' disturbances
G. K. KEL'MANS 1201

An implementable algorithm for linear time optimal control
By D. J. CLEMENTS, K. L. TEO and Z. S. WU 1223

A discrete Kalman filter for a class of non-linear stochastic systems
By Y. YAVIN 1233

Optimal output inventory decisions in stochastic markets
By J. K. SENGUPTA 1247

Sequential filter for river pollution monitoring
By T. KWATER and L. TRYBUS 1261

Driving linear systems to zero in a given time
By S. J. FARLOW 1281

NUMBER 12

Controllability, optimal control and receding horizon control of distributed multipass processes
By S. P. BANKS 1289

Inventory model with partial backorders
By K. S. PARK 1313

Some applications of rational matrices to problems in systems theory
By Y. T. TSAY and L. S. SHIEH 1319

Optimal control of singularly perturbed linear systems: single term Walsh series approach
By R. SUBBAYYAN, K. MUHAMMAD ZAKARIAH and K. R. PALANISAMY 1339

Optimum repair limit policies with a time constraint
By N. KAIO and S. OSAKI 1345

Selection and ordering in optimal portfolio choice
By J. K. SENGUPTA 1351

Deadbeat observation of linear, time-varying sampled-data systems
By P. TH. L. M. VAN WOERKOM 1361

A transformation for stability analysis of linear delay systems
By A. THOWSEN 1371

Stable sampled-data feedback control of dynamic systems with time delays
By A. THOWSEN 1379

Analysis of a two-unit cold standby redundant system with allowed down-time
By S. M. GUPTA, N. K. JAISWAL and L. R. GOEL 1385

Subject index 1393

Author index (with titles) 1397